

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference PAI 51128/WO	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/EP2005/003047	International filing date (day/month/year) 21.03.2005	Priority date (day/month/year) 29.03.2004
International Patent Classification (IPC) or both national classification and IPC INV. C08G59/14 C09D163/00		
Applicant IMPERIAL CHEMICAL INDUSTRIES PLC et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:
 - I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☐ Lack of unity of invention
 - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain documents cited
 - VII ☐ Certain defects in the international application
 - VIII ☐ Certain observations on the international application

Date of submission of the demand 11.10.2005	Date of completion of this report 06.10.2006
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Deraedt, Gilbert Telephone No. +31 70 340-2427 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/EP2005/003047**

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

5, 5a received on 12.10.2005 with letter of 11.10.2005

Claims, Numbers

1-15 received on 12.10.2005 with letter of 11.10.2005

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

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International application No. **PCT/EP2005/003047**

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes: Claims	1-15
	No: Claims	
Inventive step (IS)	Yes: Claims	1-15
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-15
	No: Claims	

2. Citations and explanations

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP2005/003047

1. Novelty and Inventive Step :

The available prior art either does not disclose or does not suggest a coating composition comprising a modified epoxy resin in which this modification is done in the claimed ratio

2. The present application therefore satisfies the criterion set forth in Article 33(2) PCT, because the subject matter of claims 1 is novel in respect to the prior art (Article 33(2) PCT) as defined in the regulations (Rule 64 (1)-(3) PCT) and is involving an inventive step (Article 33(3) PCT).

3. Claims 2-15 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

4. The subject-matter defined by claims 1-15 of the underlying application is industrially applicable.

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A and

ii) from 0.1 to 20 parts of reactive material

characterised in that

5 a) the di-epoxy resin contains minor amounts of resin components of molecular weight less than 1000 Daltons, including bis phenol A diglycidyl ether

and the reactive material comprises

b) mono-functional organic material of molecular weight at least 100 Daltons having one moiety capable of reacting with the epoxy moieties of the di-epoxy resin and

10 c) dicarboxylic acid of molecular weight less than 300 Daltons having two moieties capable of reacting with the epoxy moieties of the di-epoxy resin

In an alternative solution to the problem described above, there is provided a protective crosslinkable coating composition comprising modified epoxy resin and crosslinker the modified epoxy resin being the reaction product, by weight, of

15 i) from 80 to 99.9 parts of di-epoxy resin of epoxy equivalent weight from 500 to 5000 and formed from the reaction of bis phenol A diglycidyl ether and bis phenol A and

ii) from 0.1 to 20 parts of reactive material

characterised in that

20 a) the di-epoxy resin contains minor amounts of resin components of molecular weight less than 1000 Daltons

and the reactive material comprises

b) mono-functional organic material of molecular weight at least 100 Daltons having one moiety capable of reacting with the epoxy moieties of the di-epoxy resin and

25 c) tartaric acid having two moieties capable of reacting with the epoxy moieties of the di-epoxy resin.

Preferably the resin component comprises BADGE.

5a

By minor amount is meant that resin components of molecular weight less than 1000 Daltons, including BADGE comprise less than 50% by weight of the total di-epoxy resin solids, preferably less than 20%, more preferably less than 2%, even more preferably from 0.005% to 1%, still more preferably from 0.01% to 0.5% and most
5 preferably from 0.03% to 0.3% and where the ratio of mon-functional organic material to dicarboxylic acid calculated on a molar basis is from 3:1 to 12:1.

More preferably the reactive moieties of the organic material react with the epoxy moieties of the di-epoxy resin, especially with the epoxy moieties of the minor
10 amounts of BADGE. This tends to increase the molecular weight of the resin thereby reducing the amounts of resin component below 1000 Daltons, including the extractable BADGE. Preferably the amount of resin components of molecular weight below 1000 Daltons extractable from the crosslinked film is below 125
15 micrograms/dm² of crosslinked coating, more preferably from 1 to 100 micrograms/dm² and most preferably from 1 to 65 micrograms/dm² as measured by the method below.

Preferably the amount of BADGE extractable from a crosslinked coating of the coating

Claims

- 1) A protective crosslinkable coating composition comprising modified epoxy resin⁽⁹⁰⁾ and crosslinker the modified epoxy resin being the reaction product, by weight, of
- i) from 80 to 99.9 parts of di-epoxy resin of epoxy equivalent weight from 500 to 5000 and formed from the reaction of bis phenol A diglycidyl ether and bis phenol A and
 - ii) from 0.1 to 20 parts of reactive material
- characterised in that
- a) the di-epoxy resin contains minor amounts of resin components of molecular weight less than 1000 Daltons
- and the reactive material comprises
- b) mono-functional organic material of molecular weight at least 100 Daltons having one moiety capable of reacting with the epoxy moieties of the di-epoxy resin and
 - c) dicarboxylic acid of molecular weight less than 300 Daltons having two moieties capable of reacting with the epoxy moieties of the di-epoxy resin and where the ratio of mono-functional organic material to dicarboxylic acid calculated on a molar basis is from 3:1 to 12:1.
- 2) A protective crosslinkable coating composition comprising modified epoxy resin and crosslinker the modified epoxy resin being the reaction product, by weight, of
- i) from 80 to 99.9 parts of di-epoxy resin of epoxy equivalent weight from 500 to 5000 and formed from the reaction of bis phenol A diglycidyl ether and bis phenol A and
 - ii) from 0.1 to 20 parts of reactive material
- characterised in that
- a) the di-epoxy resin contains minor amounts of resin components of molecular weight less than 1000 Daltons
- and the reactive material comprises

- b) mono-functional organic material of molecular weight at least 100 Daltons having one moiety capable of reacting with the epoxy moieties of the di-epoxy resin and
- c) tartaric acid having two moieties capable of reacting with the epoxy moieties of the di-epoxy resin
- 3) A coating composition according to claim 1 or 2 characterised in that the resin component of molecular weight less than 1000 Daltons comprises bis phenol A diglycidyl ether.
- 4) A coating composition according to claim 3 characterised in that the amount of bis phenol A diglycidyl ether extractable from a crosslinked coating of the coating composition is less than 0.3 micrograms/dm²
- 5) A coating composition according to any one of the preceding claims characterised in that the mono-functional organic material is a mono-carboxylic acid.
- 6) A coating composition according to claim 5 characterised in that the mono-carboxylic acid is tetradecanoic acid.
- 7) A coating composition according to any one of claims 1, 3 to 6 characterised in that the di-carboxylic acid is tartaric acid.
- 8) A coating composition according to any one of the preceding claims characterised in that the amount of reactive material comprises from 1 to 20% by weight of the modified epoxy resin.
- 9) A coating composition according to any one of the preceding claims characterised in that the modified epoxy resin has at least 30% of the number of epoxy groups as on the diepoxy resin from which it is derived.
- 10) A process for producing the modified epoxy resin as defined in any one of the preceding claims comprising the steps of causing a diepoxy resin of epoxy equivalent weight of from 500 to 5000, formed by the reaction of bis phenol A diglycidyl ether and bis phenol A and containing minor amounts of resin components of molecular weight less than 1000 Daltons to react with a mono-functional organic material of molecular weight at least 100 Daltons and a dicarboxylic acid of molecular weight less than 300 Daltons.
- 11) A process according to claim 10 characterised in that the mono-functional organic

material is reacted with the diepoxy resin in a first step, the resulting product being reacted with the dicarboxylic acid in a later step.

12) A metal container coated with the coating composition according to any one of claims 1 to 9.

13) A process of producing a crosslinked coating on a metal container characterised in that it comprises the steps of applying a coating according to any one of claims 1 to 9 and causing the coating to crosslink.

14) A modified epoxy resin as defined in any one of claims 1 to 9.

15) The use of a modified epoxy resin for reducing the amount of bis phenol A diglycidyl ether extractable from a crosslinked coating composition on the interior surface of a metal container to less than $0.3 \text{ micrograms/dm}^2$, said modified epoxy resin being as defined in claim 14.